ABSTRACT TITLE: METROLOGY FOR SPATIAL INTERFEROMETRY V

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ABSTRACT:

Very high resolution spatial interferometry requires picometer level one-dimensional metrology, three-dimensional metrology and surface metrology. The absolute distance measurements have to be performed only to 1 part. in a million level due to the careful design of the instrument.

We have developed a 3 dimensional gauge that monitors the position of the corner of a corner cube in vacuum. Our goal is to monitor the changes in the position of the corner with an accuracy of 10 picometers in vacuum. The gauge is functioning inside a vacuum chamber, currently at atmospheric pressure.

In-air results from the 3 dimensional gauge indicate that we are able to track the corner cube to one nanometer level accuracy with crude surveying and subsequent. solving for parameters. The auto-alignment feature with blithering heads is demonstrated in air.

In addition, we are currently raster scanning the corner area of the corner cube to quantify the surface near the corner and to calibrate the systematic errors caused by it out.

The addition of the absolute distance measurement, capability to the relative 3 dimensional metrology gauge is progress. Due to our design, this addition does not require any modifications of the gauge heads.

In this paper, sub-nanometer vacuum results from the 3 dimensional metrology gauge with absolute metrology will be presented.

The absolute calibration of the surface metrology gauge we have developed is continuing. The results of these calibrations as well as results of white light operation will be presented.

The research described is performed at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

KEY WORDS: Spaceborne interferometry, h gh precision metrology, picometer metrology

BRIEF BIOGRAPHY:

The author is a member of the technical staff in the Interferometry Technology group of the Microwave, Lidar and Interferometer Technology section at JPL. After getting his Ph. D. from Caltech, he has worked in the Gravitational Physics Group at. Caltech, in the Artificial

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